

Appl. No. 10/043,733
Proposed Amended Claims

Proposed Amendments to the Claims:

1. (currently amended) An attenuator device having at least two ports,
the attenuator used for compensating to compensate the effect of temperature
changes in an electronic circuit comprising:

a substrate having a pair of major surfaces;

a plurality of thermistors embedded within the substrate, at least one of
the thermistors comprising a columnar body of thermistor material
extending substantially in the direction between the major surfaces; and

electrodes on the major surfaces interconnecting the thermistors in
groups, the groups forming the components of an attenuator in a
temperature compensating circuit, wherein one or more of the electrodes
are trimmable to set the value of at least one of the components;

at least three terminals forming the at least two ports, wherein one of the
terminals comprises an input electrode connected to one group of
columnar thermistors, one of the terminals comprises an output electrode
connected to at least one different group of columnar thermistors, and one
of the terminals comprises a common terminal.

2. (previously amended) The device of claim 1 wherein the substrate
comprises a low temperature co-fired (LTCC) ceramic substrate.

3. (original) The device of claim 1 wherein at least one of the thermistors
comprises a plurality of parallel-interconnected columnar bodies of thermistor
material, each body extending substantially in the direction between the major
surfaces.

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4. (previously amended) The device of claim 1 wherein the columnar body of thermistor material has opposite ends contacted with the electrodes at the respective major surfaces of the substrate and a lateral area embedded within the substrate, the embedded lateral area larger than the areas of either of the ends.

5. (original) The device of claim 1 wherein each of a plurality of thermistors comprise a columnar body of thermistor material extending substantially in the direction between the major surfaces.

6. (previously amended) The device of claim 1 wherein each component of the attenuator device comprises a plurality of parallel or series interconnected columnar bodies of thermistor material.

7. (original) The device of claim 1 wherein the columnar body has its maximum dimension extending between the major surfaces.

8. (original) The device of claim 1 wherein the columnar body has its maximum dimension extending parallel to a major surface.

9. (previously new) The device of claim 1 wherein the attenuator circuit topology is selected from the group of circuit topologies consisting of π , L, bridged T, and T.

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10. (previously new) The device of claim 1 wherein the electrodes comprise metallization patterns.

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11. (previously new) The device of claim 1 wherein the electronic circuit comprises an amplifier and the temperature coefficients of the groups of thermistors compensate for temperature induced gain changes at the amplifier.

12. (previously new) The device of claim 1 wherein the electronic circuit comprises a passive electronic circuit and the temperature coefficients of the groups of thermistors compensate for changes in the passive circuit's loss with temperature.

13. (currently amended) A low temperature co-fired ceramic (LTCC) radio frequency (RF) and microwave attenuator device having at least two ports, the attenuator used to compensate for compensating the effect of temperature changes temperature changes in an electronic circuit comprising:

a substrate having a pair of major surfaces;

a plurality of thermistors embedded within the substrate, at least one of the thermistors comprising a columnar body of thermistor material extending substantially in the direction between the major surfaces; and electrodes on the major surfaces interconnecting the thermistors in groups, the groups forming the components of an attenuator connected by the electrodes to form a temperature compensating circuit, wherein at least two groups have different temperature coefficients such that the temperature coefficient of the attenuator device compensates for the changes in the electronic circuit;

at least three terminals forming the at least two ports, wherein one of the terminals comprises an input electrode connected to one group of columnar thermistors, one of the terminals comprises an output electrode connected to at least one different group of columnar thermistors, and one of the terminals comprises a common terminal.

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14. (previously new) The device of claim 13 wherein one group of the at least two groups has a positive temperature coefficient and a second group of the at least two groups has a negative temperature coefficient.

15. (previously new) The device of claim 13 wherein the electronic circuit comprises an amplifier and the temperature coefficients of the groups of thermistors compensate for temperature induced gain changes at the amplifier.

16. (previously new) The device of claim 13 wherein the electronic circuit comprises a passive electronic circuit and the temperature coefficients of the groups of thermistors compensate for changes in the passive circuit's loss with temperature.

17. (previously new) The device of claim 13 wherein at least one of the thermistors comprises a plurality of parallel-interconnected columnar bodies of thermistor material, each body extending substantially in the direction between the major surfaces.

18. (previously new) The device of claim 13 wherein the columnar body of thermistor material has opposite ends contacted with the electrodes at the respective major surfaces of the substrate and a lateral area embedded within the substrate, the embedded lateral area larger than the areas of the ends.

19. (previously new) The device of claim 13 wherein each of a plurality of thermistors comprise a columnar body of thermistor material extending substantially in the direction between the major surfaces.

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20. (previously new) The device of claim 13 wherein each component of the attenuator comprises a plurality of series or parallel interconnected columnar bodies of thermistor material.

21. (previously new) The device of claim 13 wherein the columnar body has its maximum dimension extending between the major surfaces.

22. (previously new) The device of claim 13 wherein the columnar body has its maximum dimension extending parallel to a major surface.

23. (previously new) The device of claim 13 wherein the attenuator circuit topology is selected from the group of circuit topologies consisting of π , L, bridged T, and T.

24. (previously new) The device of claim 13 wherein the electrodes comprise metallization patterns.

25. (previously new) The device of claim 13 wherein the electronic circuit comprises an amplifier and the temperature coefficients of the groups of thermistors compensate for temperature induced gain changes at the amplifier.

26. (previously new) The device of claim 13 wherein the electronic circuit comprises a passive electronic circuit and the temperature coefficients of the groups of thermistors compensate for changes in the passive circuit's loss with temperature.

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27. (currently amended) A low temperature co-fired ceramic (LTCC) radio frequency (RF) or microwave attenuator device having at least two ports, the attenuator used to compensate for compensating the effect of temperature changes 1 temperature changes in an electrical or electronic circuit comprising:

an LTCC substrate having a pair of major surfaces;

a plurality of thermistors embedded within the substrate, at least one of the thermistors comprising a columnar body of thermistor material extending substantially in the direction between the major surfaces; and

electrodes on the major surfaces interconnecting the thermistors in groups, the groups forming the components of an attenuator in a temperature compensating circuit, wherein one or more of the electrodes are trimmable to set the value of at least one of the components;

at least three terminals forming the at least two ports, wherein one of the terminals comprises an input electrode connected to one group of columnar thermistors, one of the terminals comprises an output electrode connected to at least one different group of columnar thermistors, and one of the terminals comprises a common terminal.

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28. (currently amended) A low temperature co-fired ceramic (LTCC) radio frequency (RF) and microwave attenuator device having at least two ports, the attenuator used to compensate for compensating the effect of temperature changes temperature changes in an electronic circuit comprising:

an LTCC substrate having a pair of major surfaces;

a plurality of thermistors embedded within the substrate, at least one of the thermistors comprising a columnar body of thermistor material extending substantially in the direction between the major surfaces; and electrodes on the major surfaces interconnecting the thermistors in groups, the groups forming the components of an attenuator connected by the electrodes to form a temperature compensating circuit, wherein at least two of the groups of thermistors comprise different temperature coefficients;

at least three terminals forming the at least two ports, wherein one of the terminals comprises an input electrode connected to one group of columnar thermistors, one of the terminals comprises an output electrode connected to at least one different group of columnar thermistors, and one of the terminals comprises a common terminal.